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(56) Documents Cited  
EP 0175338 A2 WO 98/53752 A2 US 5891922 A  
US 5444094 A US 5252606 A US 5124359 A

(58) Field of Search  
Online: EPODOC, JAPIO, WPI

(54) Abstract Title  
**A sporicidal disinfectant & sterilant formulation comprising a quaternary ammonium salt with an alkyl group containing 8 to 18 carbon atoms**

(57) There is claimed a disinfectant/sterilant sporicidal formulation which comprises a quaternary ammonium salt with the alkyl or alkanyl group containing 8 to 18 carbon atoms. The counteranions may be chloride, bromide or iodide and the formulation may optionally comprise a non-ionic surfactant, a sequesterant, a co-solvent, a corrosion inhibitor, a perfume and/or colour.

There is thus provided a safe to use, environmentally friendly, aldehyde-free sterilant disinfectant with synergistic ingredients that provide sporicidal properties. The formulation is concentrated and can be diluted for use as a medical sterilant, high level disinfectant in hospitals, veterinary and food establishments (eg sterilising medical and dental instruments), and all areas where utmost hygiene is required.

It has been discovered that a particular group of quaternary ammonium compounds, with the presence of from three to six free hydroxyl groups, from one to four chlorine or bromine atoms of two quaternary nitrogens in their cations and with the presence of two ionizable anions, are very biocidal.

Antibacterial quaternary ammonium salts and the methods for production are chosen from polyhydric aliphatic alcohols - glycerol, pentaerythritol and sorbitol. The polyols are condensed with an appropriate 1,2-Epoxyalkane -ethylene or propylene oxide. The resulting polyethers are reacted with epichlorohydrin or epibromohydrin. Finally the organic halides are condensed with a tertiary amine containing one high alkyl or alkenyl or halo-substituted alkyl radical.

The formula may consist of dual chain quaternary compounds (n-alkyl dimethylethylbenzyl ammonium chloride and n-alkyl dimethylbenzyl ammonium chloride), citric acid, acetic acid, sodium citrate, isopropyl or ethyl alcohol, triethanol amine, dodecylamine and water.

The exemplified formulation consists of:  
Alkyl Dimethyl Benzyl Ammonium Chloride 20 %  
Alkyl Dimethyl 2,4 Dichlorobenzyl Ammonium Chloride 10%  
Isopropyl Alcohol 5.0%  
Non-ionic Surfactant 5.0%  
Ethylenediaminetetraacetic Acid 1.5% and  
Citric Acid 0.75%.

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### **A Disinfectant/Sterilant Sporacide Formulation**

A concentrated formulation which can be diluted with water to produce a safe non-aldehyde solution for cleaning and disinfection of medical instruments, which is rapidly sporicidal.

#### **Background of the Invention**

Medical, dental and other instruments are often made of high quality stainless steel and can be cleaned and sterilised between uses by high temperature steam under pressure. In contrast to this many instruments are made of heat-sensitive plastics, rubber, glass and electronic components. For this reason, heat sensitive instruments can only be sterilised by cold chemical germicides. Chemical sterilants presently available have many ethical and toxicological difficulties. The disclosed formula does not.

#### **Details of the Invention**

Quaternary ammonium compounds having antibacterial action are well known in the art, but have limited activity particularly against bacterial spores.

It has been discovered that a particular group of quaternary ammonium compounds, characterised by the presence of from three to six free hydroxyl groups, from one to four chlorine or bromine atoms of two quaternary nitrogens in their cations and by the presence of two ionizable anions, are very biocidal.

Antibacterial quaternary ammonium salts and the methods for production are chosen from polyhydric aliphatic alcohols - glycerol, pentaerythritol and sorbitol. The polyols are condensed with an appropriate 1,2-Epoxyalkane - ethylene or propylene oxide. The resulting polyethers are reacted with epichlorohydrin or epibromohydrin. Finally the organic halides are condensed with a tertiary amine containing one high alkyl or alkenyl or halo-substituted alkyl radical.

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This combination of cationics in combination with non-ionic surfactants, a co-solvent and sequestriants provide a unique sporicidal disinfectant.

## Typical Formulation

	Preferred	Possible
Alkyl Dimethyl Benzyl Ammonium Chloride	20%	5-50%
Alkyl Dimethyl 2.4 Dichlorobenzyl Ammonium Chloride	10%	5-50%
Isopropyl Alcohol	5.0%	1-20%
Non-ionic Surfactant	5.0%	1-20%
Ethylenediaminetetraacetic Acid	1.5%	0.1-10%
Citric Acid	0.75%	0.1-10%

A fortified quarternary ammonium compound which provides a safe to use, environmentally friendly sterilant disinfectant. The disinfectant combines synergistic ingredients that boost the performance and provide sporicidal properties that are unique in this classification of product.

The formula consists of dual chain quaternary compounds (n-alkyl dimethylethylbenzyl ammonium chloride and n-alkyl dimethylbenzyl ammonium chloride), citric acid, acetic acid, sodium citrate, isopropyl or ethyl alcohol, triethanol amine, dodecylamine and water.

The formulation is concentrated and can be diluted for use as a medical sterilant, high level disinfectant in hospitals, veterinary and food establishments and all areas where utmost hygiene is required.

**Claims:**

1. A disinfectant/sterilant sporacide formulation which comprises of, but not limited to a quaternary ammonium salt with the alkyl or alkanyl group containing 8 to 18 carbon atoms.
2. A formulation as claimed in claim 1 wherein the anions are selected from the group consisting of chloride, bromide or iodide.
3. A formulation according to claim 1 or claim 2 and further comprising a non-ionic surfactant(s).
4. A formulation according to any preceding claim and further comprising a sequesterant(s).
5. A formulation according to any preceding claim and further comprising a co-solvent.
6. A formulation according to any preceding claim and further comprising a corrosion inhibitor(s).
7. A formulation according to any preceding claim and further comprising a perfume and/or colour.



Application No: GB 9910511.6  
Claims searched: 1-7

Examiner: Stephen Quick  
Date of search: 14 February 2001

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S):

Int Cl (Ed.7):

Other: Online: EPODOC, JAPIO, WPI

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0175338 A2 (TAKEDA CHEMICAL INDUSTRIES), see whole document, especially pages 1 (lines 6-8), 5 (lines 6-8), 9 (line 27ff), 18 (lines 2-7), 24 (example 6) & 28 (example 17); quaternary ammonium with EDTA, ethyl alcohol and isopropyl alcohol	1, 2, 4 & 5 at least
X	WO 98/53752 A2 (ALBERTA), see especially pages 5 (lines 19-20) & 7 (composition at lines 17-24); quaternary ammonium with EDTA	1-4 at least
X	US 5891922 A (PRESERVE INTERNATIONAL), see whole document, especially column 3 (lines 38-45); quaternary ammonium with EDTA	1-4 & 7
X	US 5444094 A (STEPAN), see whole document, especially table 1 (column 5) for example; quaternary ammonium with EDTA	1-4 & 7 at least
X	US 5252606 A (HOWARD MARTIN), see especially formulation in columns 3 & 4; quaternary ammonium with citric acid and isopropyl alcohol	1, 2 & 5 at least

X Document indicating lack of novelty or inventive step

Y Document indicating lack of inventive step if combined with one or more other documents of same category.

& Member of the same patent family

A Document indicating technological background and/or state of the art.

P Document published on or after the declared priority date but before the filing date of this invention.

E Patent document published on or after, but with priority date earlier than, the filing date of this application.



Application No: GB 9910511.6  
Claims searched: 1-7

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Category	Identity of document and relevant passage	Relevant to claims
X	US 5124359 A (CETYLITE INDUSTRIES), see whole document, especially concentrate in table (column 9) for example; quaternary ammonium with EDTA and isopropyl alcohol	1-5 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.